VIKRAM RAMAVARAPU

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RESEARCH INTERESTS

I am interested in **data mining** and **machine learning** with **Network Science (Graphs)** and **Natural Language Processing (NLP)**, particularly applications within **Computational Social Science**, **Social Networks**, **Citation Networks**, **Bioinformatics** and **Computational Biology**.

EDUCATION

University of Illinois Urbana-Champaign (UIUC),
Computer Science **August 2024 - May 2028 (Expected)**
Ph.D. in Computer Science
• Advised by Professor George Chacko

University of Illinois Urbana-Champaign (UIUC),
Bioinformatics **August 2022 - August 2024**
Masters of Science in Bioinformatics

University of Illinois Urbana-Champaign (UIUC),
Mathematics and Computer Science **August 2019 - May 2022**
Bachelors of Science in Mathematics and Computer Science
• Graduated with High Distinction

PUBLICATIONS

- [Under Review] **Vikram Ramavarapu**, João Alfredo Cardoso Lamy, Mohammad Dindoost, David A. Bader. "Large Scale Community-Aware Network Generation" **Applied Network Science (ANS) 2025** [PDF]
- George Chacko, Minhyuk Park*, **Vikram Ramavarapu***, Ananth Grama, Pablo Robles Granda, and Tandy Warnow. "An Agent-Based Model of Citation Behavior" **Applied Network Science (ANS) 2025** [PDF]
- [Also in submission at **Nature Communications**] Mrinmoy S Roddur, **Vikram Ramavarapu**, Abigail Bunkum, Ariana Huebner, Roman Mineyev, Nicholas McGranahan, Simone Zaccaria, Mohammed El-Kebir. "Characterizing the Solution Space of Migration Histories of Metastatic Cancers with MACH2" **Research in Computational Molecular Biology (RECOMB) 2025** [PDF]
- **Vikram Ramavarapu**, Chifumi Nishioka. "Exploration of Multi-Lingual Community Structure in Scholarly Articles" **ACM/IEEE Joint Conference on Digital Libraries (JCDL) 2024** [PDF]
- Minhyuk Park*, Yasamin Tabatabaee*, **Vikram Ramavarapu***, Baqiao Liu, Vidya Kamath Pailodi, Rajiv Ramachandran, Dmitriy Korobskiy, Fabio Ayres, George Chacko, Tandy Warnow. "Well-connectedness and community detection" **PLOS Complex Systems 2024** [HTML]
- **Vikram Ramavarapu**, Fábio Jose Ayres, Minhyuk Park, Vidya Kamath Pailodi, João Alfredo Cardoso Lamy, Tandy Warnow, George Chacko."CM++-A Meta-Method for Well-Connected Community Detection" **Journal of Open Source Software (JOSS) 2024** [PDF]
- **VP Ramavarapu**, R Sowers, Ramavarapu S Sreenivas. "A smart power outlet for electric devices that can benefit from Real-Time Pricing" **International Conference on Control, Electronics, Renewable Energy and Communications (ICCREC) 2017** [PDF]

WORK HISTORY

Graduate Teaching Assistant, CS411 Database Systems @ UIUC **Aug. 2025 – Dec. 2025**

- Gave a lecture on front-end/back-end web development with **NextJS/TypeScript**, focused mainly on how to interface a web application with a database. Delivered to a lecture of about 500 students.

- Gave a lecture on **noSQL databases** and querying with **MongoDB**. Similarly, to a lecture of 500 students.
- Designed homework assignments for students learning **SQL, MongoDB**, and **Neo4j/Cypher**.
- Maintained the Illinois Prairielearn educational platform **Docker/Python/Shell**.
- Held office hours and answered queries both online and in lecture.

Research Intern, National Institute of Informatics, Tokyo, Japan **Mar. 2024 – Jul. 2024**

- Assembled a citation network dataset tagged by language and field of study (inferred from the title and abstract using **langdetect** and **mBERT** with a classification head) in order to study the network dynamics involved with cross-lingual citation.
- Deployed **Leiden graph clustering** in **Python: iGraph/Networkit** to examine patterns and community structure in cross-lingual citations. Moreover, to understand how cross-lingual citation can divide a citation network into communities.
- Conducted literature review on similar analyses of multilinguality in science through a computational lens
- Presented this work in the ACM/IEEE JCDL conference in Hong Kong

Research Assistant, El-Kebir Group @ UIUC, Champaign, IL **Jan. 2023 – Dec. 2024**

- Lead the development of a visual tool that allowed users to explore the solution space of per-patient, inferred cancer metastatis graphs, such that nodes are organs and edges are cancer migration events.
- Created functionality for oncologists and medical professionals to filter through the solution space using their known priors (e.g. known metastases or lack thereof) without needing to know how to code.
- This tool had a developer mode so that researchers trying to experiment with new inference techniques can directly open the interactive visualizer from a **Jupyter Notebook**.
- This tool was developed using **React/HTML/CSS** with the **CytoScape** and **d3.js** libraries. Portability to **Python/Jupyter Notebooks** was done using **Flask**.

Research and Development Intern, Uhnder Inc., Champaign, IL **Apr. 2022 – Jan. 2023**

- Designed virtual simulations, on **CARLA** in **Unreal Engine**, of self-driving car scenarios and generated frames of vehicle camera/radar footage.
- Developed a Parallel Radar Image processing pipeline in pure **CUDA**. Noise removal and image compression sped up from non-parallel implementation by a factor of >100x.
- Formulated an object detection pipeline for self driving cars: Trained **2D U-Net** on 2D rectangular projections of spherical radar data (r, theta, phi) to perform **Semantic Segmentation**. Improved mean IoU by 30% since initial segmentation model's implementation.
- Built a validation pipeline of these self driving car simulators, comparing simulated and real radar images, as well as older and newer simulator generated images.

Research Assistant, with Prof. Yuliy Baryshnikov @ UIUC, Champaign, IL **Aug. 2021 – May. 2022**

- Applied Cyclicity analysis, a **spectral method** which aggregates regional linear time series data to infer how a signal spreads over a medium. (Originally used in neuroscience to map the spread of trauma during a brain injury), to COVID-19 time-series data.
- Used time series data of COVID-19 cases in American states, and Canadian provinces. Isolated by time period to account for different variants. Direction of COVID-19 spread across North America was inferred using Cyclicity analysis.
- Fetched news articles on COVID-19, as well as notices made by the CDC to validate inferences made by the algorithm.

Data Engineer Intern, HBO Max, Culver City, CA **Jan. 2022 – Apr. 2022**

- Designed, implemented and productionalized method to identify potential international pricing abusers of the streaming service.
- Built a scheme to auto-generate the list using an orchestrator, using **Apache Airflow** and **Snowflake**

Software Engineer Co-op, Exelon, Chicago, IL **Aug. 2021 – Dec. 2021**

- Spearheaded entire reactor performance report generation application, given reactor design and identification, to help nuclear engineers get a proper analysis of reactor health.
- Reduced analysis time from a week's worth of manual effort to an hour for over 99% improvement in work efficiency.
- Demoed work on analysis application to the *head of the nuclear engineering team* at Exelon.

Research and Development Intern, Inprentus, Champaign, IL **Jun. 2018 – May 2019**

- Built an application to automatically generate precise statistical product reports from Atomic Force Microscopy (AFM) images of diffraction gratings. Recipients of these reports included NASA and SLAC (Stanford).
- Created macros to identify components of Scanning Electron Microscope (SEM) images of the indentation tools used to create these diffraction gratings.
- Developed material indentation simulations, using a numerical **Partial Differential Equation (PDE)** solver of the mechanical ruling process in manufacturing of diffraction gratings.
- Did a literature review of the material properties to incorporate (e.g. softness and elasticity) when designing the simulator.

ONGOING RESEARCH PROJECTS

- Using a **knowledge graph RAG (LLM)** system on a network of papers on CRISPR, linked by citation, to understand its timeline of advancements. More broadly, this methodology can be generalized to other fields of science.
- Synergy of network topological clustering, language embedding, and statistical modeling to understand the sociological basis of community formation.
- Using **network clustering** with **contrastive learning** to embed graph structure in **transformer** model weights. (Course Project)

STUDENTS MENTORED

- João Cardoso Alfredo Lamy (2023-present)

SKILLS

Deep Learning Tools/Frameworks	PyTorch, Hugging Face, TensorFlow, LangChain, JupyterLab/Colab, Large Language Models (LLMs), Ollama, PyG, Graph Neural Networks (GNNs), WandB
Programming Languages	C++, C, Java, Python, SQL, R, Bash, LaTeX, TypeScript
HPC Platforms	Amazon EC2, UIUC Research Computing (Delta), NJIT Research Computing (Wulver)
HPC tools	CUDA, OpenMP, Numba, Metal Shader Language (Apple Silicon)
General Tools	Git, Linux, Docker, Slurm, Amazon S3 (AWS), Unreal Engine
IDE	Visual Studio Code, Microsoft Visual Studio, Eclipse, Android Studio
Web Programming	NextJS, Django, React, Javascript, TypeScript, Flask, Bootstrap, d3.js, Plotly, CytoScape, Streamlit
Database	MySQL, SQLite, PostGreSQL, Neo4j, GraphQL, MongoDB, Snowflake, Apache Airflow, Tableau, Looker
Python Packages	Networkit, NetworkX, Pandas, Matplotlib, Selenium, NumPy, SciPy, Scikit-Learn, PyTest, Cartopy
C/C++ Packages and Tools	iGraph, Catch, OpenGL, CMake

RELEVANT COURSES

Machine Learning • Natural Language Processing • Probability • Linear Algebra • Statistics • Data Structures • Algorithms • Computer Architecture • Databases • Discrete Math • Differential Equations • Partial Differential Equations • Real Analysis • Graph Theory • Applied Parallel Computing • Algorithmic Genomic Biology • Bioinformatics • Anatomy & Physiology • Deep Learning with Graphs • Advanced Social & Information Networks • Applied Network Analysis • Data Mining • Numerical Methods • Deep Learning • System Programming • Web Programming • Programming Languages & Compilers • Data Visualization

AWARDS AND ACHIEVEMENTS

- Runner-up for Best Poster Award – JCDL 2024 Conference in Hong Kong
- Deans List 2019/2020 – Awarded to undergraduates in top 20% standing in their college